DRAFT
ENGINEERING EVALUATION
Broadway Family Apartments
P#17924-A#14923
810 Battery Street
San Francisco, CA 94111

BACKGROUND

Broadway Family Apartments (dba; Design Studios Gonzalo Castro) is applying for an Authority to Construct and/or Permit to Operate the following equipment:

S-1 Standby Emergency Diesel Generator Set: Diesel Engine Make: Cummins; Model: 6BTA5.9-G4; Rated Horsepower: 170 HP; Model Year: 2006; Engine Family: 6CEXL0359AAF; CARB Exec. Order: U-R-002-0316

The standby generator set will be used at Battery Street, San Francisco, CA 94111. It will provide emergency power (in the event of a blackout) for all essential electrically powered equipment at the Broadway Family Apartments site. The emergency engine must be periodically tested to ensure that it will generate electricity during an emergency outrage. This facility is within 500 feet of a school, therefore it is not allowed to operate between 7:30 a.m. and 3:30 p.m. on days when the school is in session including a school sponsored activity.

EMISSIONS SUMMARY

Annual Emissions:

The 170 HP diesel engine at S-1 is CARB Certified and the emission factors are listed below in Table (1). For this report, it is assumed that the emission value of Total Unburned Hydrocarbons (HC) is equivalent to the emission value of POC.

Table (1)

Emission Factors		
Component	Emission (g/kw·hr)	Emission (g/bhp·hr)
NOx	5.225	3.896
CO	1.100	0.820
POC	0.275	0.205
PM_{10}	0.190	0.142
SO_2*	0.0074	0.0055

**The emission factor for SO2 is from Chapter 3, Table 3.4-1 of the EPA Document AP-42, Compilation of Air Pollutant Emission Factors.*
SO_2 8.09E-3 (% S in fuel oil) lb/hp-hr = 8.09E-3 (0.0015% S) (454 g/lb) = 0.0055 g/hp-hr

Maximum Emissions in Tons per year:

The calculation for maximum emissions in tons per year is shown below in table (2).

Table (2)

Maximum Emissions in Tons per year	
NOx	= (3.896 g/bhp-hr)(170 hp)(50 hrs/yr)(1lb/453.6g) = 73.007 lb/yr = 0.037 TPY
CO	= (0.820 g/bhp-hr)(170 hp)(50 hrs/yr)(1lb/453.6g) = 15.366 lb/yr = 0.008 TPY
POC	= (0.205 g/bhp-hr)(170 hp)(50 hrs/yr)(1lb/453.6g) = 3.841 lb/yr = 0.002 TPY
PM_{10}	= (0.142 g/bhp-hr)(170 hp)(50 hrs/yr)(1lb/453.6g) = 2.661 lb/yr = 0.001 TPY
SO_2	= (0.0055 g/bhp-hr)(170 hp)(50 hrs/yr)(1lb/453.6g) = 0.103 lb/yr = 0.00005 TPY

Maximum Daily Emissions:

A full 24-hour day will be assumed since no daily limits are imposed on intermittent and unexpected operations. Check Table (3) for emissions per day.

Table (3)

Maximum Daily Emissions		
NOx	= (3.896 g/bhp-hr)(170 hp)(24 hrs/day)(1lb/453.6g) =	35.043 lb/day
CO	= (0.820 g/bhp-hr)(170 hp)(24 hrs/day)(1lb/453.6g) =	7.376 lb/day
POC	= (0.205 g/bhp-hr)(170 hp)(24 hrs/day)(1lb/453.6g) =	1.844 lb/day
PM_{10}	= (0.142 g/bhp-hr)(170 hp)(24 hrs/day)(1lb/453.6g) =	1.277 lb/day
SO_2	= (0.0055 g/bhp-hr)(170 hp)(24 hrs/day)(1lb/453.6g) =	0.049 lb/day

Plant Cumulative Increase: (tons/year): Cumulative increase from the plant is as shown in Table (4).

Table (4)

Plant Cumulative Increase			
Pollutant	Existing tons/yr.	New tons/yr.	Total tons/yr.
NOx	0	0.037	0.037
CO	0	0.008	0.008
POC	0	0.002	0.002
PM10	0	0.001	0.001
SO_2	0	0.00005	0.00005
NPOC	0	0.000	0.000

Toxic Risk Screening:
The toxic emission of diesel particulate exceeds the District Risk Screening Trigger level, as shown below in Table (5). A Risk Screening Analysis has been performed.

Table (5)

Toxic Emission Of Diesel Particulate						
Source	PM_{10} Emission Factor (g/HP-hr)	HP	Annual Usage (Hours/year)	Diesel Exhaust Particulate Emissions (lb/year)	Trigger Level (lb/yr)	Risk Screen Required? (Yes/No)
1	0.142	170	50	2.66	0.58	Yes

Calculation:

PM_{10} from CARB Certified levels 0.190 (g/kW-hr) / 1.341 (hp/kW) = 0.142 (g/hp-hr)
Diesel Exhaust Particular Emission (lb/yr.) = PM_{10} (g/hp-hr) * HP * Annual Usage (hr/yr)
= 0.142 * 170 * 50
= 1207 g/yr / 453.6 g/lb
= 2.66 lb/yr

Since the engine meets Best Available Control Technology for Toxics (TBACT) requirements (emission level of 0.15 g/hp-hr or less), the maximum acceptable cancer risk is estimated at 10 in a million. Results from the health risk screening analysis show that for 50 hours of operation per year, excluding periods when operation is required due to emergency conditions, the risk to the maximally exposed nearest receptor is 2.10 in a million. The analysis was performed at a PM_{10} emission of 2.66 lb/year (see the Nov 14, 2006 memo from the Toxics Evaluation Section). In accordance with the District's Risk Management Policy, this level of risk is considered acceptable.

Public Comments:

Since this plant is located within 1000 ft of Chin (John Yehall) Elementary School public notification is required.

STATEMENT OF COMPLIANCE

S-1 is subject to the monitoring and record keeping requirements of Regulation 9-8-530 and the SO2 limitations of 9-1-301 (ground-level concentration) and 9-1-304 (0.5% by weight in fuel). Regulation 9-8-530 requirements are incorporated into the proposed permit conditions. Compliance with Regulation 9-1 is expected since diesel fuel with a 15 ppm by weight sulfur is mandated for use in California. Like all sources, S-1 is subject to Regulation 6 ("Particulate and Visible Emissions"). This engine is not expected to produce visible emissions or fallout in violation of this regulation and they will be assumed to comply with Regulation 6 pending a regular inspection.

This application is considered ministerial under the District's proposed CEQA guidelines (Regulation 2-1-312) and therefore is not subject to CEQA review.

Best Available Control Technology (BACT):

In accordance with Regulation 2, Rule 2, Section 301, BACT is triggered for any new or modified source with the potential to emit 10 pounds or more per highest day of POC, NPOC, NOx, CO, SO_2 or PM_{10}.

Based on the emission calculations above, the owner/operator of S-1 is subject to BACT for the following pollutants: POC, NOx and CO. BACT 1 levels do not apply for 'engines used exclusively for emergency use during involuntary loss of power' as per Reference b, Document 96.1.2 of the BAAQMD BACT Guidelines for IC Engines. Hence, the owner/operator has to the meet BACT 2 limits presented below in Table (6).

Table (6)

BACT 2 Limits		
POLLUTANT	BACT 1. Technologically Feasible/ Cost Effective 2. Achieved in Practice 3. TBACT	TYPICAL TECHNOLOGY
POC	1. ***0.30 g/bhp-hr*** *[62 ppmvd @ 15% O_2]* [a,b] 2. ***1.5 g/bhp-hr*** *[309 ppmvd @ 15% O_2]* [b]	1. *Catalytic Oxidation and CARB or EPA (or equivalent) low-total hydrocarbon emitting certified engine* [a,b] 2. *CARB or EPA (or equivalent) low-total hydrocarbon emitting certified engine b,c*

NOx	1. ***1.5 g/bhp-hr*** *[107 ppmvd @ 15% O_2]* [a,b] 2. ***6.9 g/bhp-hr*** *[490 ppmvd @ 15% O_2]* [a,b,c] ***3. 69 g/bhp-hr*** *[490 ppmvd @ 15% O_2]*	1. *Selective Catalytic Reduction (SCR) + Timing Retard + Turbocharger w/ Intercooler* [a,b] 2. *Timing Retard $\leq 4^o$ + Turbocharger w/ Intercooler* [a,b,c] 3. *Timing Retard $\leq 4^o$ + Turbocharger w/ Intercooler*
CO	1. *n/s* 2. 2.75 ***g/bhp-hr*** *[319 ppmvd @ 15% O2]* [b,c]	1. *Catalytic Oxidation* [b] 2. *CARB or EPA (or equivalent) low-CO emitting certified engine b,c*

For POC, NOx, and CO, the emission limits set by BACT 2 are met, as shown in Table (7) below.

Table (7)

Analysis of BACT2 Limits			
Pollutant	Engine Emission Factors with Catalyst (g/hp-hr)	Emission Factor Limits as set by BACT 2 (g/hp-hr)	Have the limits been met?
POC	0.205	1.5	YES
NOx	3.896	6.9	YES
CO	0.820	2.75	YES

Therefore, S-1 is determined to comply with the BACT 2 limits for POC, NOx and CO. Since CARB certification data was used to establish the POC, NOx and CO emission factors, the BACT 2 emission limits have not been incorporated into the permit conditions and are assumed to be complied with through the design standards demonstrated by the CARB certification testing.

Offsets: Offsets must be provided for any new or modified source at a facility that emits more than 10 tons/yr of POC or NOx. Based on the emission calculations above, offsets are not required for this application.

PSD, NSPS, and NESHAPS do not apply.

Airborne Toxic Control Measure (ATCM): This facility will comply with Regulation 2-5 and ATCM. Compliance with the following permit conditions will meet Regulation 2-5 and the ATCM requirements.

PERMIT CONDITIONS

Condition #22850 for S-1 Emergency Standby Diesel Engine Generator Set, at Plant #17984

1) Operating for reliability-related activities is limited to 50 hours per year per engine. [Basis: "Stationary Diesel Engine ATCM" section 93115, title 17, CA Code of Regulations, subsection (e)(2)(B)(3) or Regulation 2-5]

2) The owner or operator shall operate each emergency standby engine only for the following purposes: to mitigate emergency conditions, for emission testing to demonstrate compliance with a District, state or Federal emission limit, or for reliability-related activities (maintenance and other testing, but excluding emission testing). Operating while mitigating emergency conditions or while emission testing to show compliance with District, state or Federal emission limits is not limited.
[Basis: "Stationary Diesel Engine ATCM" section 93115, title 17, CA Code of Regulations, subsection (e)(2)(A)(3)] or (e)(2)(B)(3)]

3) The owner/operator shall operate each emergency standby engine only when a non-resettable totalizing meter (with a minimum display capability of 9,999 hours) that measures the hours of operation for the engine is installed, operated and properly maintained.
[Basis:"Stationary Diesel Engine ATCM" section 93115, title 17, CA Code of Regulations, subsection(e)(4)(G)(1)]

4) Records: The owner/operator shall maintain the following monthly records in a District-approved log for at least 36 months from the date of entry (60 months if the facility has been issued a Title V Major Facility Review Permit or a Synthetic Minor Operating Permit). Log entries shall be retained on-site, either at a central location or at the engine's location, and made immediately available to the District staff upon request.
   a. Hours of operation for reliability-related activities (maintenance and testing).
   b. Hours of operation for emission testing to show compliance with emission limits.
   c. Hours of operation (emergency).
   d. For each emergency, the nature of the emergency condition.
   e. Fuel usage for each engine(s).
   [Basis: "Stationary Diesel Engine ATCM" section 93115, title 17, CA Code of Regulations, subsection (e)(4)(I), (or, Regulation 2-6-501)]

5. At School and Near-School Operation: If the emergency standby engine is located on school grounds or within 500 feet of any school grounds, the following requirements shall apply: The owner or operator shall not operate each stationary emergency standby diesel-fueled engine for non-emergency use, including maintenance and testing, during the following periods:
   a. Whenever there is a school sponsored activity (if the engine is located on school grounds).

b. Between 7:30 a.m. and 3:30 p.m. on days when school is in session. "School" or "School Grounds" means any public or private school used for the purposes of the education of more than 12 children in kindergarten or any of grades 1 to 12, inclusive, but does not include any private school in which education is primarily conducted in a private home(s). "School" or "School Grounds" includes any building or structure, playground, athletic field, or other areas of school property but does not include unimproved school property.
[Basis: "Stationary Diesel Engine ATCM" section 93115, title 17, CA Code of Regulations, subsection (e)(2)(A)(1)] or (e)(2)(B)(2)] End of Conditions

RECOMMENDATION

Issue an Authority to Construct to Broadway Family Apartments Located at 810 Battery Street, San Francisco, CA 94111:

EXEMPTIONS
None.

By: Madhav Patil Date: 1/23/06

Air Quality Engineering

Acronyms:			
S	Source	NPOC	Non- Precursor Organic Compound
HP	Horse Power	TBACT	Best Available Control Technology for Toxics
CARB	California Air Resource Board	BACT	Best Available Control Technology
NOx	Oxides of Nitrogen as NO_2	BAAQMD	Bay Area Air Quality Management District
CO	Carbon Monoxide	IC Engines	Internal Combustion Engines
POC	Precursor Organic Compound	EPA	Environmental Protection Agency
HC	Hydrocarbons	SCR	Selective Catalytic Reduction
PM_{10}	Particulate Matter	PSD	Prevention of Significant Deterioration
SO_2	Sulfur Dioxide	NSPS	New Source Performance Standard
O_2	Oxygen	NESHAPS	National Emission Standard for Hazardous Air Pollutants
ppmv	parts per million by volume	CEQA	California Environmental Quality Act
ATCM	Airborne Toxic Control Measure		